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O r g a n i z a t i o n
of the
I n s t i t u t e o f N u c l e a r R e s e a r c h
of the Polish Academy of Science
subject to the Plenipotentiary of the Government and
to the Commission for Affairs of the Peaceful Use of Nuclear
Energy of the Polish Academy of Science

The Institute of Nuclear Research of the Polish Academy of Science has been established in October, 1955.

870 workers are employed in the Institute, viz.:

graduates	322
technicians /college/	105
others /elementary/	72
administrative officers	89
highly skilled workmen	57
skilled workmen	57
labourers	151

The scientific establishments of the Institute are settled in Warsaw, Cracow, and Łódź.

Now, the Institute is being reorganized. The actual scheme of organization is as follows:

1. General Director / Prof.Dr.A.Soltan /
2. V-Director for Scientific Affairs
3. V-Director for Technical Affairs / Prof.R.Podarewski/
4. V-Director of Administration

After reorganization in charge of the Institute will be a general director / always a scientist /, a director of organization and a chief engineer.

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Consultative bodies will be

the Scientific Board with two bodies,
one composed of chemists, the other of physicists,
and the College, composed of directors and managers
and chiefs of the Establishments and Sections.

Scientific Establishments and Sections

1. Establishment I A of Nuclear Physics /Z.Wilhelmi, Doc, k.n./
2. Establishment I B of Neutron Spectrometry and Nuclear
Radiation Influence on Solids /B.Buras, Doc/
3. Establishment II of Nuclear Physics - Cracow
/ H.Niewodniczański, Prof., Dr. /
4. Establishment III of Electronics / J.Keller, Prof. /
5. Establishment IV of Chemical Technology and Reactor Materials
/ T.Adamski, Doc./
6. Establishment V of Radiochemistry and Chemistry of Isotopes
/ J.Campbell, Dr. /
7. 1.Establishment of Cosmic Rays - Warsaw /M.Danysz, Prof.,Dr./
2.Establishment of Cosmic Rays - Cracow
/ M.Mięsowicz, Prof., Dr. /
3.Establishment of Cosmic Rays - Łódź
/ A.Zawadzki, Prof., Dr. /
8. Analytical Section / J.Minczewski, Doc. /
9. Section of Reactor Exploitation / J.Aleksandrowicz, Mgr.,Ing./
10. Health Section / E.Kowalski, Doc., Dr. /
11. Section of Education / J.Pniewski, Prof., Dr. /
12. Section of Reactor Development / W.Frankowski, Mgr., Ing./
13. Section of Documentation and Scientific Information
/ A.Szperl, Mgr. /
14. Design Office / W.Ney, Ing. /
15. Other Sections: Section of Organization and Employment,
Section of Planning, Supply Section,
Section of Administration, Budget Section,
Technical Section and Main Workshop.

Two year's existence of the Institute of Nuclear Research

The Institute of Nuclear Research has been established in the middle of 1955.

To illustrate the activity of the Institute more fully it is necessary to describe nuclear studies in this country in the period before the Instytute started.

Until 1953, i.e. when in many countries such as the U.S.A., United Kingdom, and U.S.S.R. - the atomic industry already runs, nuclear power plants were erected, gigantic accelerators constructed; when reactors became normal equipment of universities, in Poland, we were coping with enormous economic difficulties.

As the nuclear physics requires particularly expensive and complicated instruments, and the existing scientyfic establishments suffered shortage of financial means, the conditions were not at all favorable. Consequently, the scope of the research work had to be adjusted to the limited technical means, thus becoming not particularly important and attractive. Moreover, there was a lack of scientists, who not numerous before the war II, were in the days of oppressive persecuted, and scantered all over the world.

In spite of those bad conditions there have been existing two centres of nuclear physics, one at the Warsaw University, and the other at the Jagiellonian University in Cracow, both cooperating with establishments of the Polish Academy of Science.

The work of the centre in Warsaw was mainly based on the accelerator of copacity 1 MeV. Nuclear reactions and neutron moderation were studied there. Erection of Van de Graaff's generator and beta-rays spectrometer has started. Additionally, many prototypes of detecting instruments have been designed and manufactured, and studies of unstable heavy particles, and of collisions of great energy have been continued.

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In the other centre in Cracow studies have been developed of photonuclear reactions, structural investigation by means of non-coherent neutron dissipation, gamma radiation, large bunches of cosmic rays, etc.

All those studies were carried out with only limited means. That is why, none of the outstanding physicists were occupied with problems of reactor technique or physics of fission process, and none of the chemists were interested in technology of reactor materials, plutonium chemistry, etc.

Such was the situation in 1954, when an establishment was formed to develop the design and to erect the first experimental reactor in the country. In the course of several months there was created the Establishment for Physics of Elementary Particles of the Polish Academy of Science / such was the cryptonic name of that establishment / and physical and chemical laboratories were organised and erected. The Establishment enjoyed careful protection of the Government offices, it must be added. The staff, mostly very young people, in spite of scarcity of literature, designed the project of a reactor.

The reactor was to be cooled with gas, with natural uranium, and graphite as the moderator. Consequently, some industrial plants were ordered to manufacture graphite and auxiliary materials for the uranium programme. The reactor was to be built of materials existing in the country and some positive results have been achieved.

As however in 1955 the USSR declared themselves for being ready to sell us an experimental reactor and cyclotron, the existing plan had to be changed. Studies of the own reactor were suspended and its authors have occupied themselves with the new problem of building a nuclear power plant. So, in the middle of 1955, the Polish science viewed unexpectedly new prospects of gaining two great tools for nuclear research, which would enable the developing of fundamental scientific studies and building foundations for the nuclear energetic.

Consequently, it was necessary to mobilize many scientists of different specialities in order to be prepared to handle the reactor and cyclotron, and to develop the sphere of scientific activity. Preparations were to depend on the erection of proper

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laboratories, and various supplementary instruments, and on training a staff of scientists and technicians.

As the problems have been complicated ones and there were different scientific specialities it was necessary to concentrate all efforts within a single, strong and efficient organisation. And so the Institute of Nuclear Research was called into existence on June 1955.

Professor Dr Andrew Soltan has been appointed as the general director of the Institute. The establishments of the Polish Academy of Science in Warsaw and Cracow and the Establishment for Physics of Elementary Particles of the Polish Academy of Science have been incorporated and their studies continued.

The Institute started with a programme comprising a wide range of pure scientific and technical problems, thus becoming an institute of wide scientific field.

At the same time, the newly created Institute of Nuclear Research has got additional duties, such as learning, popularization etc., connected with the problem of utilization of nuclear energy in Poland, for it has been the only institution predestinated to be occupied with nuclear problems.

The heavy burden of manifold activities and lack of any prospective plan of the utilization of nuclear energy in Poland, caused the activities of the Institute at its very beginning to show some traces of confusion.

July, 1956, the situation of the Institute of Nuclear Research became easier after the Plenipotentiary of Affairs of Nuclear Energy Utilization had been appointed. He has his Office and is in charge of the Government Council of Affairs of Nuclear Energy Utilization, which has been called into existence after the previous Government Commission.

The Plenipotentiary has been entrusted with affairs of coordinating all works of the scope of nuclear energy and, above all, the task of preparing the multi-year plan and other things connected with utilization of nuclear energy.

The Institute of Nuclear Research has been submitted directly to the Plenipotentiary of the Government and, with reference to scientific activity, the Institute is subject to the

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Polish Academy of Science acting through Commission for Affairs of the Peaceful Use of Nuclear Energy.

Manifoldness of the Institute's activities is reflected in the structural organization of the Institute and its division into establishments sections and laboratories. The scientific activity of the respective sections can be outlined as follows.

Establishment I A, i.e. the Establishment of Physics 1 / address : ul. Hoża 69, Warsaw / is carrying out studies, which can be called fundamental studies in the field of physics of atomic nucleus.

The main course of the research work is the neutron physics and nuclear reactions of small energies. The basic tool to-day, is the accelerator of capacity 1 MeV, which is the property of the Warsaw University. It is expected that within a few months the Van de Graaff's generator will be set into motion. Moreover, at the end of the year, erection will be finished of the thermic reactor with water moderator of capacity 2 MW and flux 10^{13} n/cm² sec. Studies on spectrography are also being in development.

Establishment I B, i.e. the Establishment of Physics 2. / Address: ul. Panieńska, Warsaw /. Its field is mainly the application of nuclear physics to structural studies and investigation of solids. Now, the Establishment starts to new courses of research, one being neutronographic structural studies, the other studies of the influence of nuclear radiation on solids and especially on semi-conductors.

It will be possible, in the near future for the Establishment to do some work in the field of neutron spectroscopy, like the Establishment I A.

Establishment II, i.e. the Establishment of Physics 3 / Address: ul. Gołębia 13, Cracow / is of similar character as the Establishment I A, and its activity concentrates round fundamental studies of nuclear physics. As for the physicists in Warsaw the main tool will soon be the reactor, so the Cracovian physicists will take advantage of the cyclotron which will be able to accelerate deuterons of energy 12 MeV. The accelerator, imported from USSR, will be set in motion in year 1958. Before it comes it may be possible to run

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a small cyclotron. That cyclotron is constructed entirely in the country. The main trends of the Establishment II are nuclear reactions of medium energies, spectroscopy, and structural studies applying to thermal neutron scattering. Recently, research has begun on nuclear resonance.

Establishment III, i.e. the Establishment of Electronics and Automatics / address: Warsaw-Żerań /, has the task of design and construction of unique instruments required by the laboratories of the Institute. In the first period of its existence the Establishment developed research and study of construction, consequence of there was the construction of prototypes of different nuclear instruments, which then were multiplied within the Institute or outside. The other task of the Establishment III is to suggest, to other institutes and factories, manufacturing programmes including production of elements indispensable for construction of new equipment for nuclear studies.

Establishment IV, i.e. the Establishment of Technology of Reactor Materials./ Address: Warsaw-Żerań /. This Establishment has existed as a section of the former Establishment for Physics of Elementary Particles and its original aim was to develop technology of gaining the metallic uranium and reactor graphite from the existing raw-materials. As the project of erection of an experimental reactor had been suspended the plan of studies of the Establishment IV had to be also partially changed. The graphite problem was limited. Now, its chief task is to develop the most economical methods of uranium extraction from the existing ore, of gaining a concentrate through mechanical enrichment, and of receiving nuclear pure uranium compounds and metallic uranium. Within the Establishment's interest are analytic problems of determination of traces of contaminants, and studies connected with heat treatment of metallic uranium and technique of obtaining fuel elements.

Establishment V, i.e. the Establishment of Radiochemistry and Chemistry of Isotopes/ address: Warsaw-Żerań /, has rather different activities. The principal of them are for the time being, distribution of isotopes, and in the future, it will be the production of radioisotopes by means of the reactor,

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synthesis of uranium compounds, consultations on the erection of isotope laboratories, on the use of radioisotopes in different branches of science and technique, and cooperation with users of the isotopes. Moreover, the Establishment develops and improves measuring methods being important for studies of isotopes, design of sets of instructions for isotope treatment etc.

The Establishment also is to be in close cooperation with physicists on the studies of nuclear reactions, of spectrum analysis, and other work where radiochemical methods are applied. The Establishment is interested in the studies of plutonium chemistry and separation of plutonium and some other elements and fission products. There are also studied problems of neutralization of radioactive waste products.

Establishment VI, i.e. the Establishment of Cosmic Rays / addresses: ul. Hoża 69, Warsaw, Cracow, Łódź / continues studies of unstable particles resulting from the collisions at high energy, applying the method of nuclear emulsion, of large bunches of cosmic rays, of effect of fast particles on materials using the method of nuclear emulsion. The Establishment cooperates with several countries from the People's Democracies and with the United Institute of Nuclear Research.

In addition to the scientific establishments the Institute of Nuclear Research has several selfacting sections. Some of them emerged recently from those establishments described above.

Analytical Section develops analytical methods principally for the use of the Establishment IV, from which it emerged. There methods are developed of determination of uranium in ore, products of its treatment and those deriving from recycling of nuclear fuel, of determination of such traces of contaminants as boron, lithium, sodium, aluminium etc. in reactor, and continue basic studies combined with the analysis of reactor materials.

Section of Energetics also recently achieved its independence. It emerged from the former Establishment I which split into Energetic Section, and Establishments I A and I B.

The main task of the Section is to find the most proper type of a power plant, which would suit the conditions in the country. Studies are carried out of the general problems of

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nuclear energetics, of preliminary projects of the unconventional sections of some nuclear power plants, / for self-education purposes /; the problem of nuclear drive for vessels is considered, popularizing and didactic activity is developed, and problems of nuclear energetics propagated. Worth mentioning is its contribution to the preparation of the development plan of nuclear energetics in Poland.

Health Section. Besides the tasks its name suggests, it develops some scientific studies in the field of nuclear radiation influence on the metabolism in human body, and above all, on the metabolism of porphyrine, and on the coagulation system.

Tasks of the Section of Reactor Exploitation now depend on the training of personnel for reactor operation and in the near future, on the efficient setting in motion, running, and maintenance of the reactor. The Section will also develop studies of the reactor in different exploitation conditions, and cooperate with other Establishments and Sections in experiments with the reactor.

Section of Education train the new admitted workers of the Institute of Nuclear Research, and scientists and engineers from outside, who intend to handle the radioactive isotopes. The task is carried out through organization of theoretical and practical courses of several stages for the respective specialities. The Section also cooperates with the University of Warsaw teaching physicists of nuclear speciality.

To describe the organization of the Institute fully it must be added that the scientific workers form a Scientific Board which is divided into two parts: the Board of Physics and the Board of Chemistry. It controls the scientific activity of the Institute, discusses plans and reports of the Establishments, ratifies scientific works and publications, etc. Moreover, there is a College formed of the management of the Institute, which is mainly occupied with things other than scientific affairs.

There are not many scientific establishments in the country that can boast such a rapid and spontaneous development as the Institute of Nuclear Research.

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Such a rapid growth of the Institute of Nuclear Research is unusual in our conditions. The growth illustrates the table below, giving data referring to the employment of workers occupied with the basic problems.

Period	E m p l o y m e n t			Building surface sq.m.
	Scientific workers	Graduates	Technicians and lab. assistants	
June, 1955	18	57	27	
Dec., 1955	21	148	62	
Dec., 1956	24	293	163	

As from the above table results the rapid growth of employment of graduates was not accompanied by the relative growth rate of the number of managing staff i.e. scientific workers. In the late 1956, one scientific worker corresponded with 12 graduates.

It must be stated that the ratio is not favourable, and it will badly affect the future development of the scientific work at the Institute.

To appreciate the activity of the Institute thus far it can be said that the past period brought some positive achievements. In 1956, the workers of the Institute published 25 works and the further 24 prepared to print. Among them there are works about cosmic rays, non-coherent neutron dissipation, nuclear reactions, determination of traces of contaminants in the reactor materials of the country, etc.

The greatest effort however, has been put in the work connected with the preparation of the future works in the field of fundamental research. It consists in designing and building of a number of instruments.

Consequently, the project of linear proton accelerator of 10 MeV has been remarkably advanced, erection of a universal neutron spectrometer has begun, as well as design of neutron selectors. To cooperate with the selectors a 144 canal time analyser and a 14 canal amplitude analyser is being constructed.

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The erection of Van de Graaff's generator of 4 MeV is coming to the end, the small cyclotrons of 3 MeV is being set in motion. Construction of several types of spectrometers for beta and gamma rays has been finished or considerably advanced.

The spin echo apparatus has been constructed, the hodoscope for studying of large bunches, the Wilson's chamber is beginning to be built, and a good many others. Moreover, the apparatus for production and investigation of monocrystals has been built. The laboratories of the Establishment for Electronics and Automatics designed and manufactured prototype series of a number of G.M.- counters, electrometers, chambers, monitors, etc.

To some limited extent positive results have been achieved in the field of technology of reactor materials. Among others, studies of the extraction of inorganic compounds, and uranium, have been continued and some information acquired about equilibrium among phases. Basic elements have been established and construction started of some important equipment like the installation for gaining of uranium fluoride to be reduced with metallic calcium, etc. Moreover, a number of analytical methods have been developed for controlling the processes of uranium and graphite technology and other auxiliary materials connected with the uranium programme.

Moderate are the achievements in the field of radiochemistry and chemistry of isotopes. The reason were difficulties of organization character so that studies could be undertaken in 1956.

The main efforts were directed towards the establishing of basic elements and projecting of radiochemical laboratories, which now are being built in the Centre of Nuclear Research.

Nevertheless, in the recent period, instruments were prepared for the production of some isotopes on laboratory scale, some preliminary steps were made towards the studies of plutonium extraction, and a great effort is being made at the distribution of imported isotopes. Radioactive isotopes of several curie and the worth of rubel 100 000 have been distributed among 17 users. The laboratory surface and equipment were insufficient.

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The outline of the activity of the Institute of Nuclear Research, would be not complete if we would not mention the cooperation with other institutions in the country and abroad. The cooperation 'home' is different. Common conferences are organized, some problems are partially entrusted to be developed outside, equipment is ordered in the factories, manufacturing is suggested of standart equipment and elements indispensable for nuclear equipment, consultations are granted in the matter of laboratory design and equipment, handling of radioactive isotopes and establishing of basic elements for design of instruments, etc. Particularly efficient was the cooperation of the Institute of Nuclear Research at the elaboration of the prospective plan of activity connected with nuclear energy utilization in Poland. Of the total number of 55 reports 37 were prepared by the workers of the Institute of Nuclear Research.

The Institute of Nuclear Research began to contact with other countries as late as in 1956. In the course of the year 1956, about 50 workers of the Institute, physists, chemists and electronics, took part in different conferences and meetings abroad, and 38 practiced or did some scientific studies in the foreign centres. The Institute also organized international conferences: the Polish - Czechoslovakian conference of nuclear energetics in Zakopane and consultation on the effects of high energy in which physists took part of the USSR and countries of People's Democracies. Several physists and chemists from Czechoslovakia, USSR, Hungary, DDR, and China visited the Institute, and our workers called on different foreign centres on the occasion of various scientific conferences.

The achievements of the Institute could be more satisfactory if there were no disturbing factors in the past period.

One of the most serious disadvantages was back of a prospective development plan for the activities connected with utilization of nuclear energy in Poland, and back of any information refering to the kind and resources of uranium ore of the country .

As the information was furnished there is no doubt more now, and the prospective development plan for the activities connected with utilization of nuclear energy will soon be submitted to be accepted by the Government Commission of Affairs of Nuclear Energy Utilization.

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Further hindrance is the already mentioned lack of scientific workers. This difficulty can be eliminated by endeavouring to raise qualifications of the workers through scientific work and practice in the best centres abroad. The first effort in this matter have already been done.

The normal development of the Institute of Nuclear Research is hindered by scarcity of rooms. It is frequent that in one room of about 30 sq.m. carry out their experimental work six or more physicists and electronics.

The situation will change, as the big Centre of Nuclear Research - Polish Harwell, is being built in Świerk, near Warsaw by Otwock.

In 1957 the first experimental reactor will be erected in Świerk. Round it laboratories are being built to be finished in 1960. The other centre is being built in Bronowice near Cracow.

In 1957 the Section of Reactor Exploitation and Establishments I A and I B will move to Świerk. They will settle in up - to - date comfortable laboratories of cubature 14 500 cu.m.

They will be followed by other Establishments of the Institute of Nuclear Research in Warsaw except the Establishment IV which remains in Żerań, and Establishment VI which will enjoy the hospitality of the University in Warsaw.

According to the project of Świerk, the total cubature of all laboratories and offices, together with a little hotel for guests, who will study using the reactor, will amount to about 100 000 cu.m., and the number of all workers in the Institute of Nuclear Research will be 900 in 1960.

At the same time, in Żerań will be occupied about 350 workers and cubature of laboratories and other buildings will be approx. 25 000 cu.m.

In the Institute of Nuclear Research in Cracow will then work about 220 men and the total cubature will be 40 000 cu.m.

The above outlays will reach enormous sums. The Polish society however, expect successful development of the nuclear research and nuclear energetics, this being not possible without a wide experimental foundation and education of a skilled staff of scientific and technical workers.